

Doc No: FRM-LAB-009a

Rev.No/Date: 02 / 11.01.2019

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**ÖLÇÜM RAPORU**  
**MEASUREMENT REPORT**

TL-806
19-TST-0095-133
06-19

**Müşterinin Adı Adresi**  
Customer name/address

: HERA EĞLENCE VE MİMARİ AYDINLATMA SİSTEMLERİ A.Ş.  
Güllübağlar Mah. Kahramanlar Cad. No:3-1 34906 PENDİK-  
İSTANBUL/TÜRKİYE

**İstek Numarası**  
Order No

: 19-TST-0095-133

**Numunenin Adı ve Tarifi**  
Name and identity of test item

: 3D Vertical Tube Series RGB

**Numunenin kabul tarihi**  
The date of receipt of test item

: 25.04.2019

**Açıklamalar**  
Remarks

: DGC'ye , IES LM-79-08 standardı uyarınca fotometrik ölçümler yapılmıştır.  
Photometric measurement has been applied to EUT according to IESNA LM-79-08

**Deneyin Yapıldığı Tarih**  
Date of Test

: 11.06.2019

**Raporun Sayfa Sayısı**  
Number of Pages of the Report

:20

Deney laboratuvarı olarak faaliyet gösteren TÜV AUSTRIA TURK, International Accreditation Service, Inc. (IAS) TL-806 ile TS EN ISO/IEC 17025 Nisan 2012 standardına göre akredite edilmiştir.  
TÜV AUSTRIA TURK is accredited by International Accreditation Service, Inc. (IAS) under registration number TL-806 for TS EN ISO/IEC 17025 April 2012 as a test laboratory.

International Accreditation Service, Inc. (IAS) deney raporlarının tanınırlığı konusunda Avrupa Akreditasyon Birliği(EA) ile Çok Taraflı Anlaşma ve Uluslararası Laboratuvar Akreditasyon Birliği(ILAC) ile karşılıklı tanıma anlaşması imzalamıştır.  
International Accreditation Service, Inc. (IAS) is a signatory to the European co-operation for Accreditation (EA) Multilateral Agreement (MLA) and to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) for the recognition of test reports.

Deney ve /veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ( olması halinde ) ve deney metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.  
The test and/or measurement results, the uncertainties ( if applicable ) with confidence probability and test methods are given on the following pages which are part of this report.

Bu rapor, laboratuvara gönderilen numunelere uygulanan deney/deneyler sonucu hazırlanmıştır. Müşteriye ait diğer numuneleri kapsamaz.  
This report was prepared according to test results of specimens sent to laboratory. It doesn't contain other specimens belonging to customer.

**Mühür ve Tarih**  
Seal and Date



**Deney Sorumlusu**  
Person in charge of test

Gürhan CANSIZ

**Onaylayan**  
Approval

Gürhan CANSIZ

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1.1

**DGC, Çevre Şartları ve Sembollerin Tanımları** (Description of the EUT, Environmental Conditions and Symbol Definitions)

<b>Markası / Brand</b>	: HERA
<b>Modeli / Model</b>	: 3D Vertical Tube Series RGB
<b>Seri Numarası / Serial Number</b>	: P01041085
<b>Beyan Gücü / Rated Power</b>	: 16 W
<b>Beyan Gerilimi / Rated Voltage</b>	: 48 VDC
<b>Beyan Akımı / Rated Current</b>	: 0,34 A
<b>Sembollerin Tanımı / Definitions of Symbols</b>	DGC= Deneden Geçen Cihaz EUT=Equipment Under Test



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**1.2 Deney Standartları (Test Standards)**

Deneyler aşağıdaki standartlara göre yapılmıştır (The tests were performed according to following standards):

**Standart / Standard**

- IESNA LM-79-08 Electrical and Photometric Measurements of Solid-State Lighting Products

**1.3 Deney Ekipmanları (Test Equipments)**

Kayıt No. (ID – No.)	Tip (Type)	Kalibrasyon Tarihi (Calibration Date)	Sonraki Kalibrasyon Tarihi (Next Calibration Date)	Kontrol (Check Point)
LAB-011	Goniophotometer	09.01.2019	09.01.2020	<input checked="" type="checkbox"/>
LAB-015	AC Power Supply	05.06.2018	05.06.2019	<input checked="" type="checkbox"/>
LAB-027	Powermeter	09.01.2019	09.01.2020	<input checked="" type="checkbox"/>
LAB-023	Standart Lamp	09.01.2019	09.01.2020	<input checked="" type="checkbox"/>
LAB-012	Integrating sphere	09.01.2019	09.01.2020	<input checked="" type="checkbox"/>

**1.3 Komponent listesi (Component list)**

Komponent (Components)	Üretici (Manufacturer)	Model (Model)	Teknik Veri (Technical Data)	Standart no. (Standart No.)
LED	Cree Inc	CLX6FFKC RGB Led	Led-RGB I F = 3 5 m A V R = 5 V φV = Initial Data x 0.7	Cree® LED Lamp Reliability Test Standard (JEITA ED- 4701 100 105, MIL-STD- 202G, JEITA ED-4701 200 201, JEITA ED- 4701 100 103, JEITA ED-4701 200 202, IEC 60529:2011)
PCB	Baskı Devre	C13016_R1.0	1.6mm FR44 Layers, 35+ 35 + 35 + 35um Cu, White Solder Resist, Black Solder Resist, Gold Surface Finish	-

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**2.1 Deney Sonuçları ( Test Results )****Elektriksel Ölçümler**

(Electrical Measurements)

<b>Ölçülen Güç (W)</b> (Input Power)	15,84
<b>Ölçülen Gerilim (V)</b> (Input Voltage)	48
<b>Ölçülen Akım (A)</b> (Input Current)	0,33
<b>Güç Faktörü (PF)</b> (Power Factor)	1
<b>Ölçülen Frekans (Hz)</b> (Input Frequency)	50
<b>Ortam Sıcaklığı / Bağıl Nem</b> (Ambient Temperature / Relative Humidity)	25,1 °C 48% Rh
<b>Stabilizasyon Süresi</b> (Stabilization Time)	60 dk ±5dk

**Fotometrik Ölçüm Sonuçları**

(Photometric Measurement Results)

<b>Toplam Işık Akısı</b> (Total Luminous Flux) (lm)	491,75
<b>Maksimum Işık Şiddeti</b> (Max. Light Intensity) (cd)	76,38
<b>Armatür Etkinliği</b> (Luminaire Efficacy) (lm/W)	31,04



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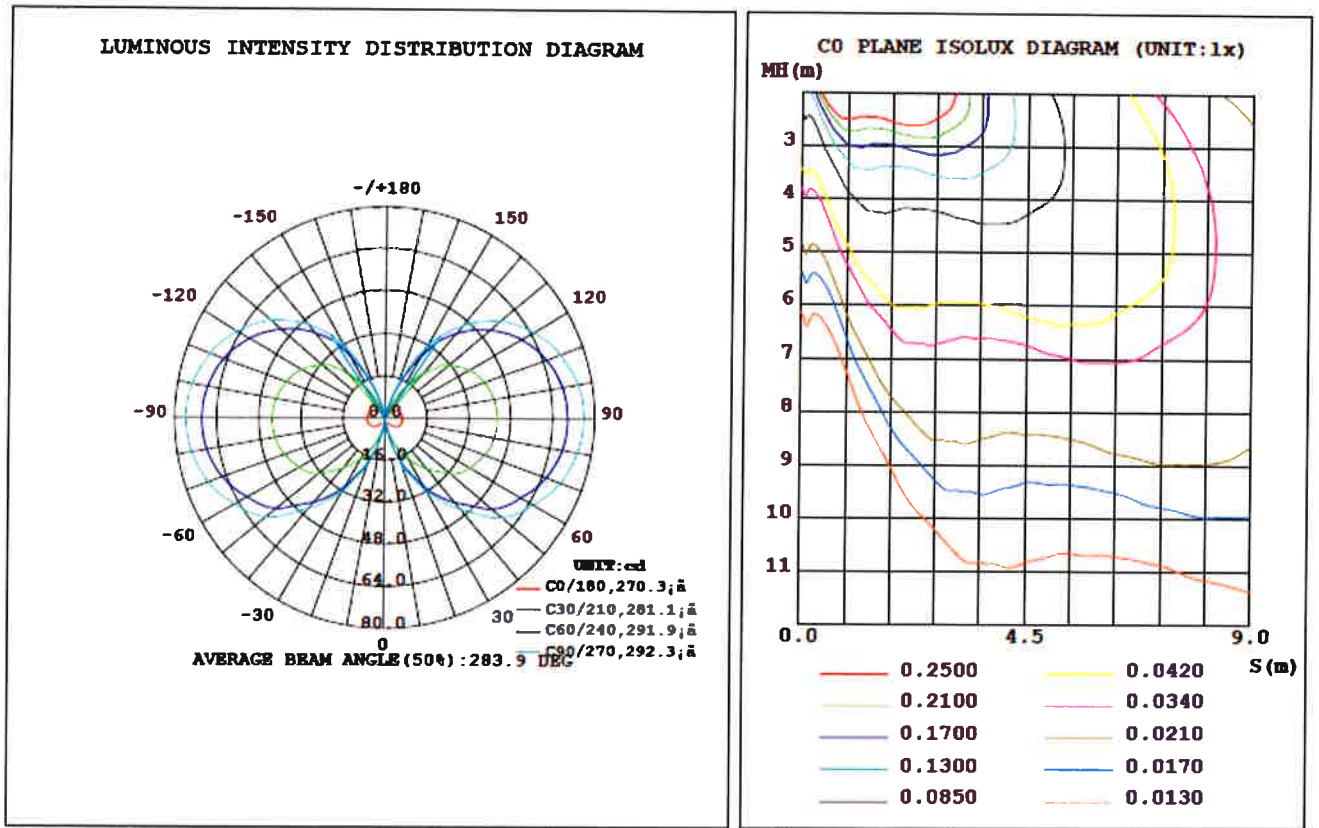
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**2.1 RGB Renk Fotometrik Deney Sonuçları (Photometric Test Results of RGB)**



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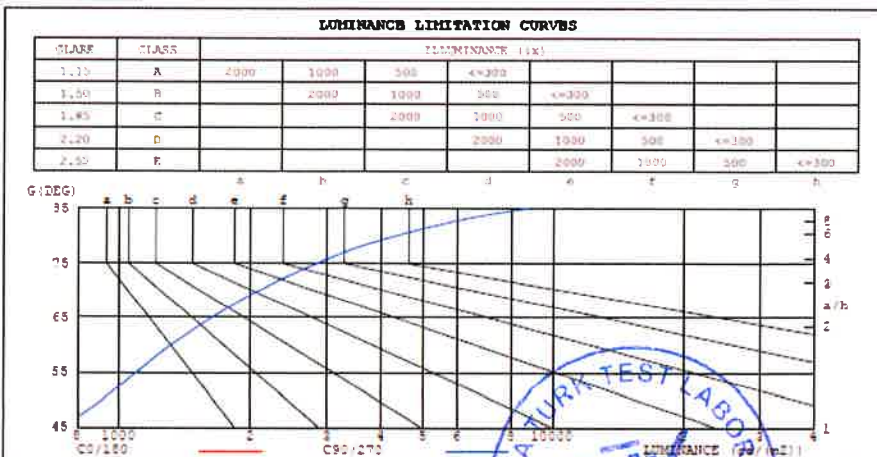
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**2.1 RGB Renk Fotometrik Deneş Sonuçları (Photometric Test Results of RGB)**

**ZONAL FLUX DIAGRAM  
AND LUMINANCE LIMITATION CURVES**

**ZONAL FLUX DIAGRAM:**

$\gamma$	C0	C48	C90	C135	C180	C225	C270	C315	$\gamma$	$\Phi_{zone}$	$\Phi_{total}$	$\Phi_{lum, lamp}$
5	0.5504	1.324	1.501	1.324	0.5504	1.324	1.501	1.324	0- 5	0.0221	0.0221	0.00,0.00
10	0.9827	2.432	4.694	3.432	0.9827	2.432	4.694	3.432	5- 10	0.1581	0.1801	0.04,0.04
15	1.818	7.902	10.88	7.902	1.818	7.902	10.88	7.902	10- 15	0.6271	0.8072	0.16,0.16
20	1.847	12.60	17.77	12.60	1.847	12.60	17.77	12.60	15- 20	1.584	2.391	0.49,0.49
25	2.000	18.05	24.72	18.05	2.000	18.05	24.72	18.05	20- 25	2.021	3.422	1.11,1.11
30	2.289	23.65	31.74	23.65	2.289	23.65	31.74	23.65	25- 30	4.802	10.22	2.08,2.08
35	2.901	29.26	38.88	29.26	2.901	29.26	38.88	29.26	30- 35	7.022	17.26	3.51,3.51
40	2.756	34.00	45.11	34.00	2.756	34.00	45.11	34.00	35- 40	9.495	26.75	5.44,5.44
45	4.565	38.82	51.92	38.82	4.565	38.82	51.92	38.82	40- 45	12.10	38.86	7.9,7.9
50	5.206	44.22	58.72	44.22	5.206	44.22	58.72	44.22	45- 50	15.15	54.00	11.11
55	5.908	47.95	62.82	47.95	5.908	47.95	62.82	47.95	50- 55	18.05	72.06	14.7,14.7
60	6.192	50.27	65.68	50.27	6.192	50.27	65.68	50.27	55- 60	20.24	92.42	18.8,18.8
65	6.422	52.72	68.89	52.72	6.422	52.72	68.89	52.72	60- 65	22.41	114.8	22.4,22.4
70	6.562	54.77	71.40	54.77	6.562	54.77	71.40	54.77	65- 70	24.25	139.2	28.2,28.2
75	6.708	56.21	73.24	56.21	6.708	56.21	73.24	56.21	70- 75	25.98	165.2	32.6,32.6
80	6.768	57.22	74.60	57.22	6.768	57.22	74.60	57.22	75- 80	27.22	192.4	39.1,39.1
85	6.749	57.97	75.52	57.97	6.749	57.97	75.52	57.97	80- 85	28.07	220.5	44.8,44.8
90	6.670	58.14	75.88	58.14	6.670	58.14	75.88	58.14	85- 90	28.48	248.9	50.6,50.6
95	6.580	57.82	75.58	57.82	6.580	57.82	75.58	57.82	90- 95	28.44	277.4	56.4,56.4
100	6.464	57.07	74.60	57.07	6.464	57.07	74.60	57.07	95-100	27.97	305.2	62.1,62.1
105	6.260	55.88	72.98	55.88	6.260	55.88	72.98	55.88	100-105	27.11	332.4	67.6,67.6
110	6.168	54.28	71.02	54.28	6.168	54.28	71.02	54.28	105-110	25.84	358.2	72.9,72.9
115	5.912	52.22	68.58	52.22	5.912	52.22	68.58	52.22	110-115	24.22	382.5	77.8,77.8
120	5.510	49.64	65.22	49.64	5.510	49.64	65.22	49.64	115-120	22.24	404.8	82.3,82.3
125	5.041	46.56	61.45	46.56	5.041	46.56	61.45	46.56	120-125	20.00	424.8	86.4,86.4
130	4.217	42.96	56.95	42.96	4.217	42.96	56.95	42.96	125-130	17.51	442.2	89.9,89.9
135	3.432	38.88	51.68	38.88	3.432	38.88	51.68	38.88	130-135	14.88	457.2	92.92
140	2.622	34.06	45.69	34.06	2.622	34.06	45.69	34.06	135-140	12.03	469.2	95.4,95.4
145	1.727	26.58	39.82	26.58	1.727	26.58	39.82	26.58	140-145	9.222	478.4	97.2,97.2
150	1.142	19.79	32.16	19.79	1.142	19.79	32.16	19.79	145-150	6.494	484.9	98.6,98.6
155	0.8087	13.18	21.82	13.18	0.8087	13.18	21.82	13.18	150-155	2.967	488.9	99.4,99.4
160	0.2909	6.696	12.52	6.696	0.2909	6.696	12.52	6.696	155-160	2.022	490.9	99.8,99.8
165	0	1.892	4.506	1.892	0	1.892	4.506	1.892	160-165	0.7180	491.6	100,100
170	0	0	0.3811	0	0	0	0.3811	0	165-170	0.1215	491.7	100,100
175	0	0	0	0	0	0	0	0	170-175	0.0004	491.7	100,100
180	0	0	0	0	0	0	0	0	175-180	0	491.7	100,100



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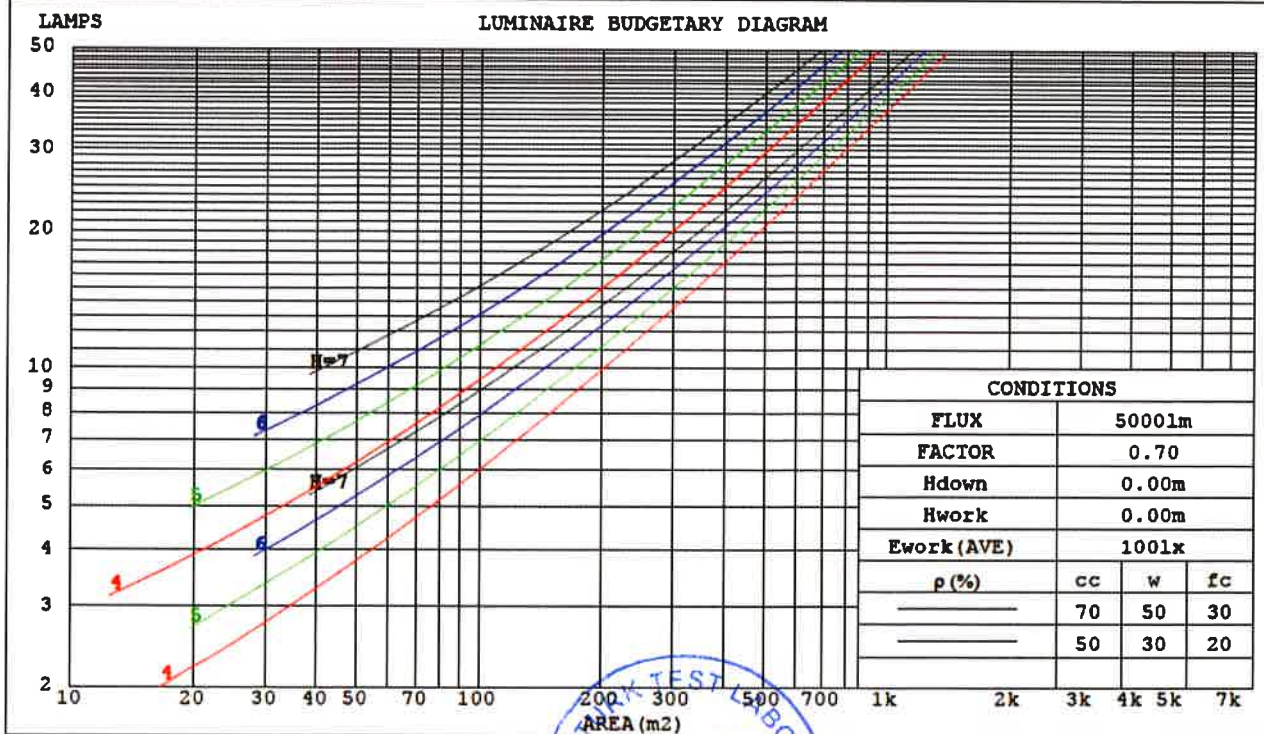
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**ÖLÇÜM RAPORU**  
**MEASUREMENT REPORT**

**2.1 RGB Renk Fotometrik Deney Sonuçları (Photometric Test Results of RGB)**

**CU AND LUMINAIRE BUDGETARY ESTIMATE DIAGRAM**

pcc	80%			70%			50%			30%			10%			0
	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	0
pw	0															
ffc	20%			20%			20%			20%			20%			0
0.0	1.07	1.07	1.07	.99	.99	.99	.84	.84	.84	.70	.70	.70	.57	.57	.57	.51
1.0	.85	.79	.73	.78	.72	.67	.64	.60	.56	.52	.49	.46	.41	.38	.36	.30
2.0	.71	.62	.55	.65	.57	.51	.53	.47	.42	.42	.38	.34	.32	.29	.26	.21
3.0	.60	.51	.43	.55	.46	.40	.45	.38	.33	.35	.30	.26	.27	.23	.19	.15
4.0	.52	.42	.35	.47	.39	.32	.39	.32	.26	.30	.25	.21	.23	.19	.15	.11
5.0	.46	.36	.29	.42	.33	.26	.34	.27	.21	.27	.21	.17	.20	.16	.12	.09
6.0	.40	.31	.24	.37	.28	.22	.30	.23	.18	.24	.18	.14	.18	.13	.10	.07
7.0	.36	.27	.20	.33	.24	.19	.27	.20	.15	.21	.16	.12	.16	.11	.08	.05
8.0	.32	.23	.17	.29	.21	.16	.24	.18	.13	.19	.14	.10	.14	.10	.07	.04
9.0	.29	.21	.15	.27	.19	.14	.22	.16	.11	.17	.12	.09	.13	.09	.06	.04
10.0	.27	.19	.13	.24	.17	.12	.20	.14	.10	.16	.11	.07	.12	.08	.05	.03



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**2.1 RGB Renk Fotometrik Deney Sonuçları (Photometric Test Results of RGB)**

**WEC AND CCEC**

pcc	80%			70%			50%			30%			10%			0
	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	
pw	20%			20%			20%			20%			20%			0
pfc	20%			20%			20%			20%			20%			0
RCR	RCR:Room Cavity Ratio						Wall Exitance Coefficients (WEC)									
0.0																
1.0	.443	.252	.080	.421	.240	.076	.379	.217	.069	.341	.196	.063	.305	.177	.057	
2.0	.364	.200	.061	.344	.189	.058	.306	.170	.053	.270	.152	.047	.238	.134	.042	
3.0	.315	.168	.050	.296	.159	.048	.261	.142	.043	.229	.125	.038	.199	.110	.034	
4.0	.278	.145	.043	.261	.137	.040	.229	.121	.036	.199	.107	.032	.171	.093	.028	
5.0	.250	.127	.037	.234	.120	.035	.204	.106	.031	.177	.093	.028	.151	.081	.024	
6.0	.227	.114	.033	.212	.107	.031	.185	.095	.028	.159	.083	.024	.136	.071	.021	
7.0	.207	.103	.029	.194	.097	.028	.169	.085	.025	.145	.074	.022	.123	.064	.019	
8.0	.191	.093	.026	.179	.088	.025	.155	.078	.022	.133	.068	.019	.113	.058	.017	
9.0	.177	.086	.024	.166	.081	.023	.144	.071	.020	.123	.062	.018	.104	.053	.015	
10.0	.165	.079	.022	.154	.075	.021	.134	.066	.019	.115	.057	.016	.097	.049	.014	

pcc	80%			70%			50%			30%			10%			0
	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	
pw	20%			20%			20%			20%			20%			0
pfc	20%			20%			20%			20%			20%			0
RCR	RCR:Room Cavity Ratio						Ceiling Cavity Exitance Coefficients (CCEC)									
0.0	.567	.567	.567	.484	.484	.484	.331	.331	.331	.190	.190	.190	.061	.061	.061	
1.0	.569	.534	.503	.487	.459	.433	.333	.315	.299	.192	.183	.174	.061	.059	.056	
2.0	.564	.513	.471	.483	.442	.407	.331	.306	.284	.191	.178	.167	.061	.058	.054	
3.0	.557	.499	.452	.478	.430	.392	.328	.299	.275	.189	.174	.162	.061	.057	.053	
4.0	.550	.487	.440	.472	.421	.382	.324	.293	.269	.188	.172	.159	.060	.056	.052	
5.0	.542	.478	.431	.466	.414	.375	.321	.289	.265	.186	.170	.157	.060	.055	.052	
6.0	.535	.471	.425	.460	.408	.370	.317	.286	.262	.184	.168	.156	.059	.055	.051	
7.0	.528	.465	.421	.454	.403	.367	.314	.283	.260	.182	.167	.155	.059	.055	.051	
8.0	.521	.460	.418	.449	.399	.364	.310	.280	.258	.181	.165	.154	.058	.054	.051	
9.0	.515	.455	.415	.443	.395	.362	.307	.278	.257	.179	.164	.153	.058	.054	.051	
10.0	.509	.452	.413	.439	.392	.361	.304	.276	.256	.178	.163	.153	.058	.054	.051	



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**2.1 RGB Renk Fotometrik Deney Sonuçları (Photometric Test Results of RGB)**

**Uncorrected UGR Table**

ceiling/cavity	0.7	0.7	0.5	0.5	0.3	0.7	0.7	0.5	0.5	0.3
walls	0.5	0.3	0.5	0.3	0.3	0.5	0.3	0.5	0.3	0.3
working plane	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Room dimensions	Viewed crosswise					Viewed endwise				
x = 2H y = 2H	5.2	6.3	6.0	7.2	8.3	11.4	12.6	12.3	13.5	14.6
3H	7.1	8.2	8.0	9.1	10.3	15.2	16.2	16.1	17.2	18.3
4H	8.2	9.2	9.1	10.1	11.3	17.2	18.2	18.1	19.2	20.4
6H	9.2	10.2	10.2	11.1	12.3	19.5	20.4	20.4	21.3	22.6
8H	9.8	10.7	10.7	11.6	12.9	20.7	21.6	21.6	22.5	23.8
12H	10.4	11.2	11.3	12.2	13.4	22.0	22.9	23.0	23.9	25.1
4H 2H	8.7	9.7	9.6	10.6	11.8	12.1	13.1	13.0	14.0	15.2
3H	11.0	11.9	12.0	12.8	14.1	16.1	16.9	17.0	17.9	19.2
4H	12.2	13.0	13.2	14.0	15.3	18.3	19.1	19.3	20.1	21.4
6H	13.4	14.1	14.3	15.0	16.3	20.8	21.5	21.7	22.5	23.8
8H	13.9	14.5	14.9	15.5	16.8	22.1	22.8	23.1	23.8	25.1
12H	14.4	15.0	15.4	16.0	17.3	23.6	24.2	24.6	25.2	26.5
8H 4H	14.7	15.4	15.7	16.4	17.7	18.8	19.4	19.7	20.4	21.7
6H	16.4	17.0	17.4	18.0	19.3	21.6	22.1	22.5	23.1	24.5
8H	17.2	17.7	18.2	18.7	20.1	23.1	23.6	24.1	24.7	26.0
12H	17.9	18.4	18.9	19.4	20.8	24.9	25.3	25.9	26.4	27.7
12H 4H	15.5	16.1	16.5	17.2	18.5	18.8	19.4	19.8	20.4	21.7
6H	17.5	18.0	18.5	19.0	20.4	21.7	22.2	22.7	23.3	24.6
8H	18.6	19.0	19.6	20.0	21.4	23.4	23.9	24.4	24.9	26.3
Variations with the observer position at spacings:										
S = 1.0H	+ 0.1 / - 0.1					+ 0.1 / - 0.1				
1.5H	+ 0.2 / - 0.2					+ 0.2 / - 0.3				
2.0H	+ 0.3 / - 0.3					+ 0.3 / - 0.4				

CIE Pub.117 Corrected 491.7 lm Total Lamp Luminous Flux. (8log(F/F0) = -2.5)



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**2.1 RGB Renk Fotometrik Deney Sonuçları (Photometric Test Results of RGB)****UTILIZATION FACTORS TABLE**

REFLECTANCE										
Ceiling	0.8	0.8	0.8	0.7	0.7	0.7	0.5	0.5	0.5	0
Walls	0.7	0.5	0.3	0.7	0.5	0.3	0.7	0.5	0.3	0
Working plane	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0
ROOM INDEX	UTILIZATION FACTORS (PERCENT) $k(RI) \times RCR = 5$									
$k = 0.60$	33	20	12	31	19	12	28	17	11	4
0.80	42	27	18	39	26	17	34	23	16	6
1.00	49	34	24	45	32	23	39	30	20	9
1.25	56	41	31	52	38	29	44	33	25	12
1.50	61	46	36	57	43	34	48	37	30	14
2.00	69	55	45	64	51	42	54	44	37	18
2.50	74	62	52	69	57	48	58	49	42	21
3.00	79	67	57	72	62	53	61	53	46	24
4.00	84	74	65	78	68	61	65	58	52	28
5.00	88	79	71	81	73	66	68	62	56	31
ROOM INDEX	UF(total)									Direct
According to DIN EN 13032-2 2004			Suspended				SHRNOH = 1.25			



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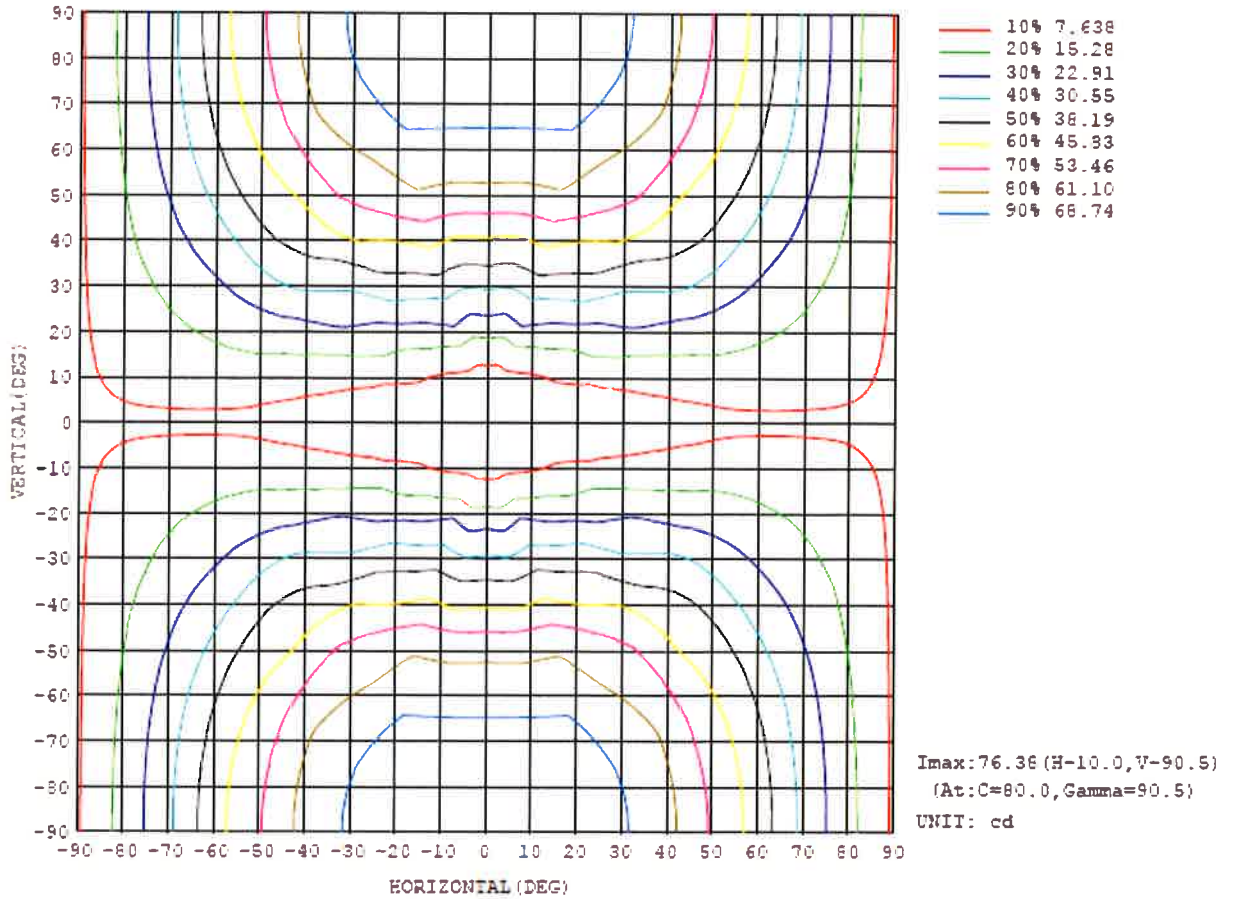
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2.1 RGB Renk Fotometrik Deney Sonuçları (Photometric Test Results of RGB)

**ISOCANDELA DIAGRAM**



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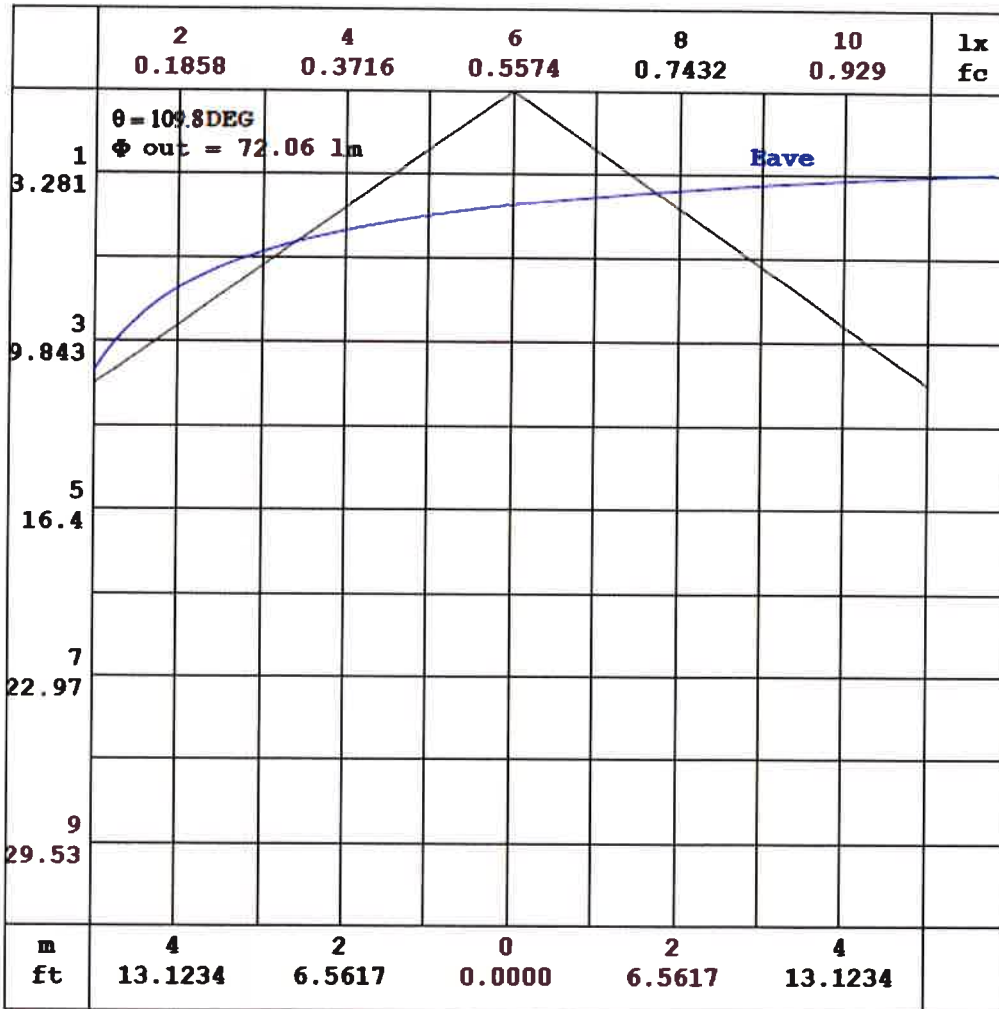
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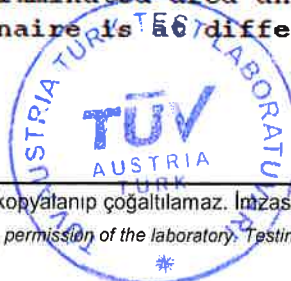
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2.1 **RGB Renk Fotometrik Deney Sonuçları** (Photometric Test Results of RGB)

**AAI CURVES**



Note: The Curves indicate the illuminated area and the average illumination when the luminaire is at different distance.



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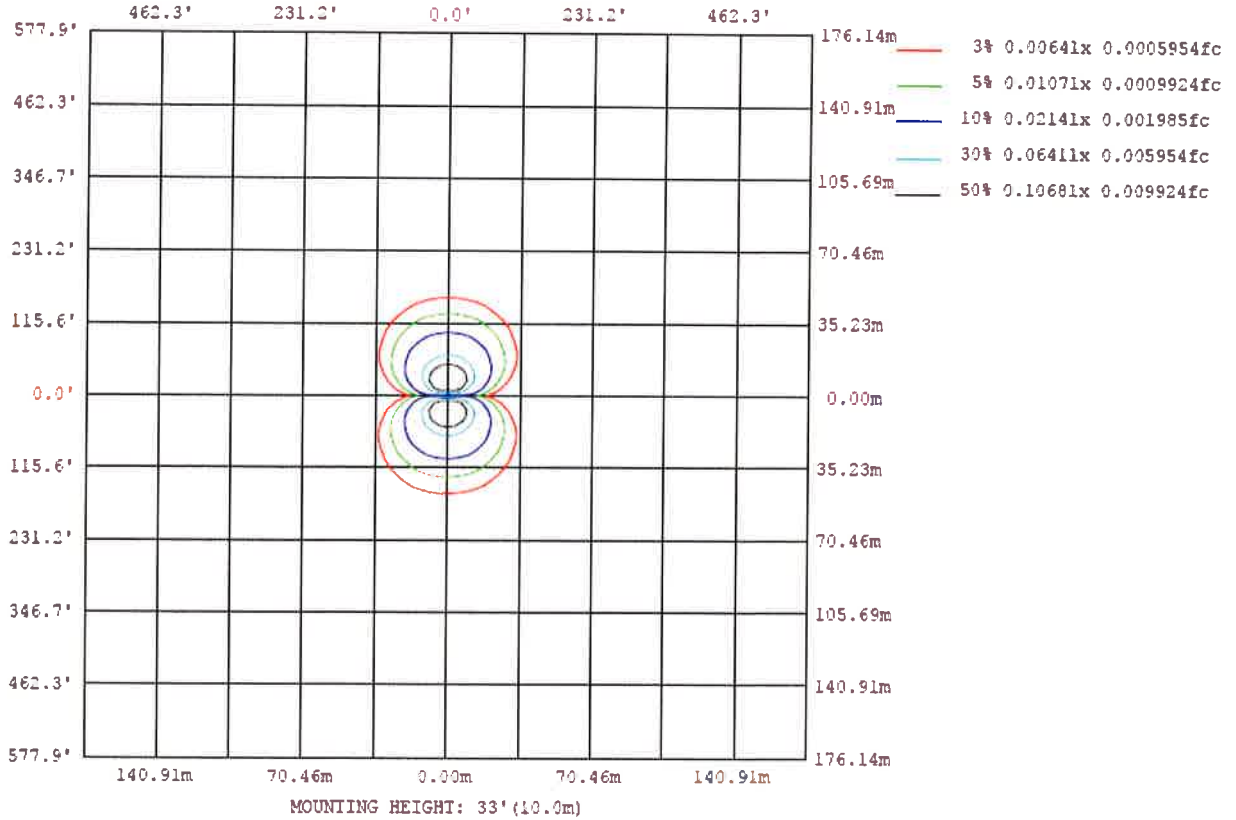
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**2.1 RGB Renk Fotometrik Deney Sonuçları (Photometric Test Results of RGB)**

**ISOLUX DIAGRAM**



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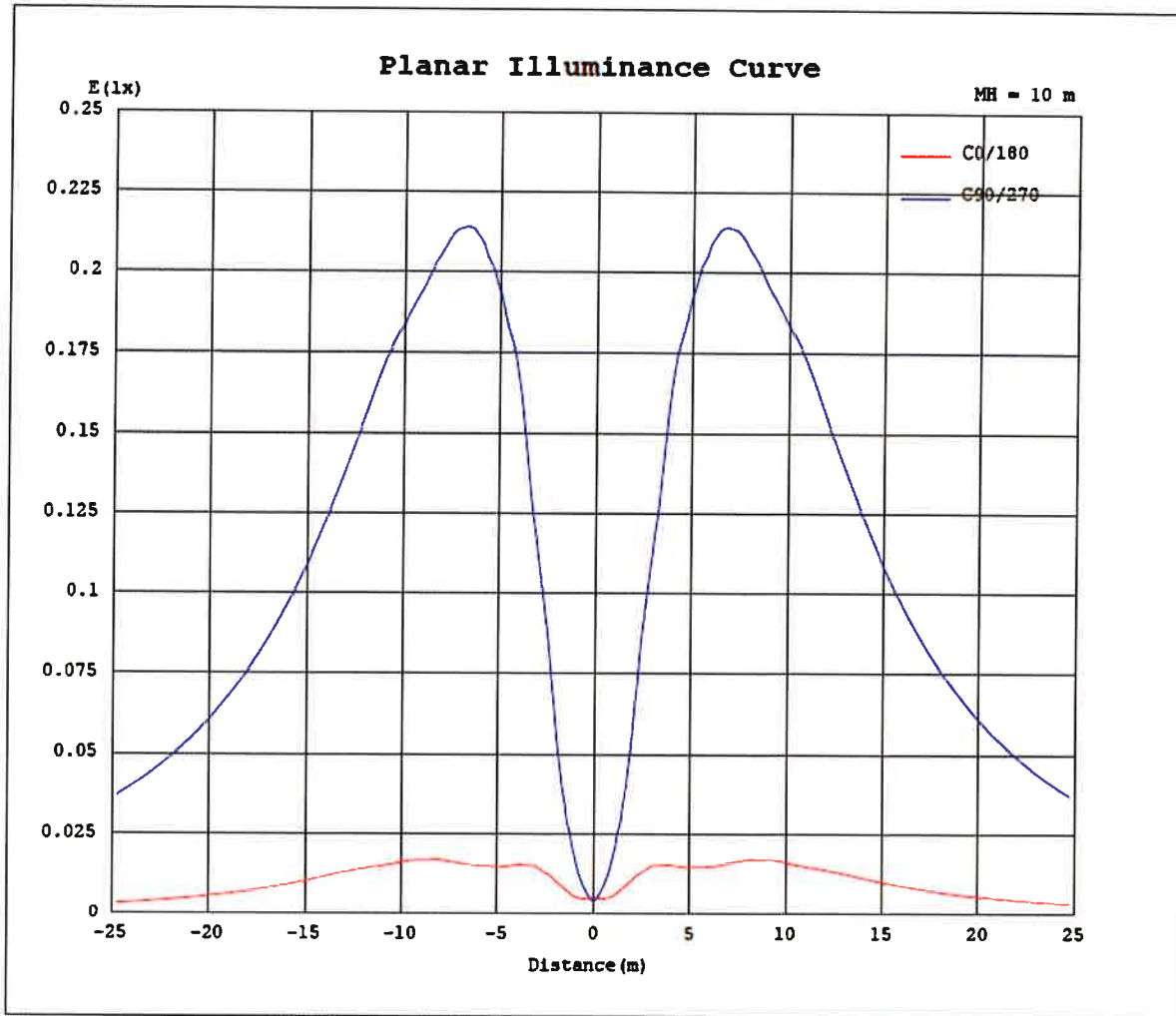
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**2.1 RGB Renk Fotometrik Deney Sonuçları (Photometric Test Results of RGB)**



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**2.2 RGB Renk Spektrokolorimetrik Deney Sonuçları (spectrocolorimetric Test Results of RGB)****Elektriksel Ölçümler**  
(Electrical Measurements)

Ölçülen Güç (W) (Input Power)	15,84
Ölçülen Gerilim (V) (Input Voltage)	48
Ölçülen Akım (A) (Input Current)	0,33
Güç Faktörü (PF) (Power Factor)	1
Ölçülen Frekans (Hz) (Input Frequency)	50
Ortam Sıcaklığı / Bağıl Nem (Ambient Temperature / Relative Humidity)	25 °C 48% Rh
Stabilizasyon Süresi (Stabilization Time)	60 dk ±5dk

**Spektrokolorimetrik Ölçüm Sonuçları**  
(Spectrocolorimetric Measurement Results)

Chrom x	0,2689
Chrom y	0,2821
Duv	0,0061
Chrom u'	0,1817
Chrom v'	0,4337
Peak	466 nm
Dominant	481 nm
CCT	12452 K
Nominal CCT	12000 K
Ra(CRI)	39
R9	-216
S/P Ratio	3,8
Preburning time	1 hr
Test Configuration	4π



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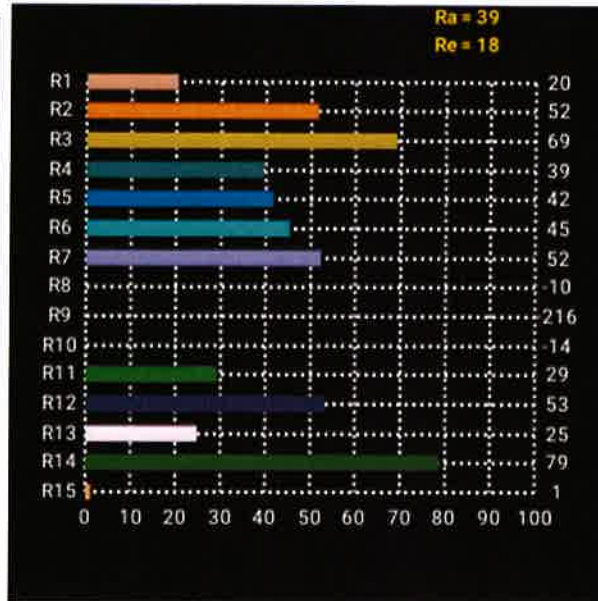
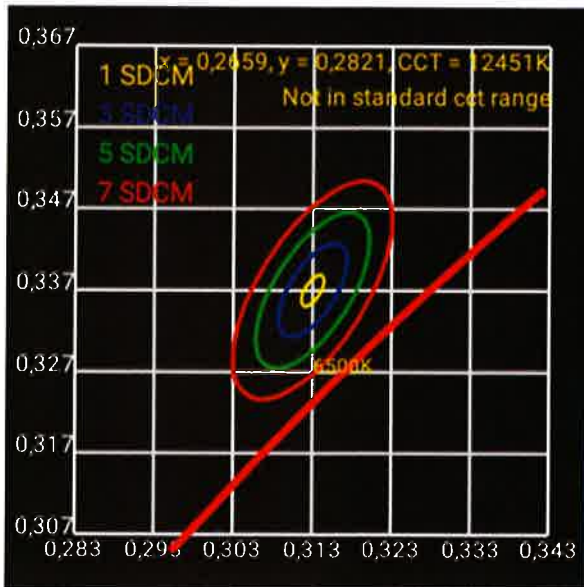
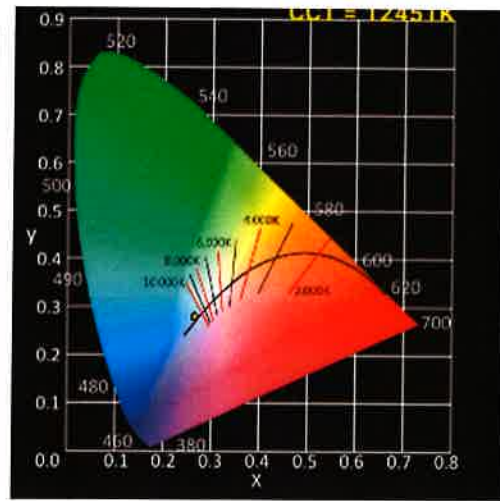
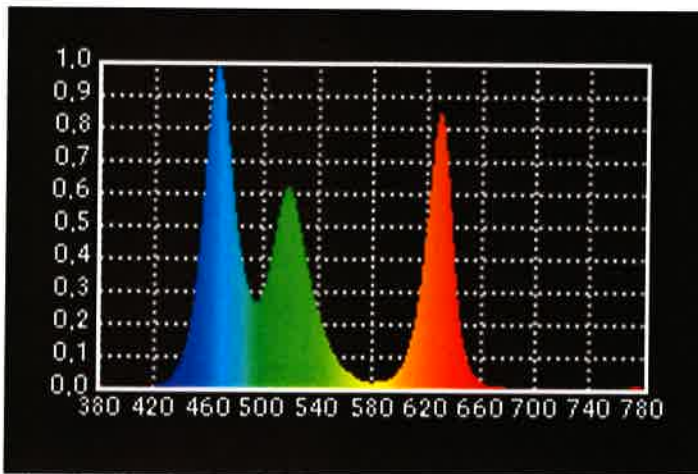
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### 2.2 RGB Renk Spektrokolorimetrik Deney Sonuçları (Spectrocolorimetric Test Results of RGB)

#### Spectral Power Distribution



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**3.1 DGC'nin Fotoğrafları (Photos of EUT)**



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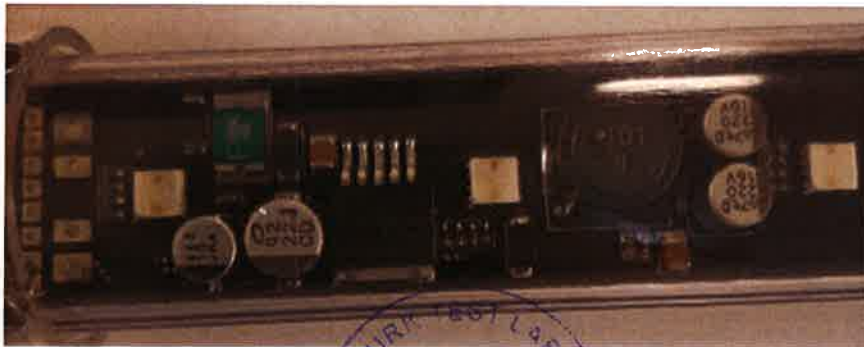
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**3.1 DGC'nin Fotoğrafları (Photos of EUT)**



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**3.1 DGC'nin Fotoğrafları (Photos of EUT)**



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